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Planning and Planting FIELD SHELTERBELTS

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PLANNING AND PLANTING FIELD SHELTERBELTS

Introduction

Since 1901 FREE TREES have been supplied to farmers in the Prairie Provinces for shelterbelt planting. These trees have been grown and distributed by Dominion Forest Nursery Stations located at Indian Head and Sutherland, Saskatchewan. (Sutherland Station was established in 1914.) Broadleaf trees are supplied free of charge, while a small charge is made for evergreen trees. Planters pay express charges on shipments.

For the most part this Department and tree planters have concentrated attention on establishing farm and home shelterbelts for the purpose of providing protection to people, livestock, gardens and buildings. Up to and including the spring of 1946 over 200 millions of broadleaf trees have been distributed to over 4,000 planters a year, and practically 5 millions of evergreen trees to over 800 planters a year. (Distribution of evergreen trees began in 1910.)

During the past fifteen years, however, many farmers have given some attention to the planting of field shelterbelts for the purpose of improving conditions for crops being grown under field conditions (table p. 12). This publication is intended to give help and advice with this type of prairie farm tree planting.

Benefits from Field Shelterbelts

Statements given on a Forest Nursery Station questionnaire indicate that the majority of planters of field shelterbelts in the Prairie Provinces believe that the benefits resulting from such shelterbelts compensate for the time and labour involved in planting and maintaining them. Planters have also observed that in dry years benefits from them are greater than in wet years. They know, too, that field shelterbelts must be a reasonable height before any benefits from them may be expected.

Studies reported by the Soils Research Laboratory, Dominion Experimental Station, Swift Current, Saskatchewan, show that a fairly dense shelterbelt twenty-five to thirty feet high may be expected to reduce wind velocity to a distance of four hundred feet to leeward. At two hundred feet the wind velocity will be about 50 per cent of that in the open. An open belt fifteen to twenty feet high will cause a reduction in wind velocity of approximately 25 per cent at a distance of two hundred feet to leeward.

Tests conducted by the Soils Research Laboratory, Swift Current, at the Forest Nursery Station, Indian Head, showed that a single-row white spruce belt twenty-five feet high brought about a significant reduction in wind velocity, e.g.:

(1) At fifty feet from the belt the wind velocity was 20 per cent of the wind velocity in the open,

(2) At two hundred and fifty feet the wind velocity was 75 per cent of the wind velocity in the open.

The influence of this same spruce belt on the evaporation of soil moisture was also recorded; e.g.:

(1) At fifty feet from the belt the evaporation of soil moisture was 60 per cent of that in the open,

(2) At two hundred and fifty feet the evaporation of soil moisture was 90 per cent of that in the open.

(Left)
To be effective a field shelterbelt must be dense near the ground.

(Below)
Recording influence of field shelterbelt on wind velocity.

(Left)
Development of crops is uniform within the protection of field shelterbelts.

(Above)
A dense caragana hedge protects this grain crop.

To the extent that wind velocity is reduced there is a proportionate reduction in soil drifting, in the rate of evaporation of moisture from the soil, and in the amount of transpiration of water by crop plants.

Mechanical injury to crop plants by soil drifting is also lessened, and the appearance of field shelterbelts on a farm means a good deal to people living in the prairies.

Growth of crops may be poor near an established field shelterbelt for a distance almost equal to its height. This condition is due to the fact that trees require and use all the moisture and plant food within the area occupied by tree roots. These margins should be kept cultivated.

The influence of a hedge or tree belt on snow accumulation is well known. For a belt seven to ten feet high this influence may extend as far as seventy-five feet to leeward. Snow accumulation is accompanied by increased soil moisture in the area covered by the snow, and in a greater area on slightly sloping land. Snow accumulation is particularly important in winters of light snowfall for the filling of dugouts during spring run-off.

When conditions favour snow accumulation, and taking into account field shelterbelt influences on wind velocity, increased crops of grains may be expected up to distances varying from fifty to two hundred feet to leeward of fairly dense field shelterbelts. Such increases will vary from season to season, from location to location, and from crop to crop; a conservative expected average increase might be five bushels of grain per acre. In dry years there will be a high grain to straw ratio in such areas.

Many planters with perennial hay crops near their field shelterbelts have reported improved yields of these crops. Livestock producers whose pasture and hay crops are equally as important as grain crops should consider this effect. The increase, no doubt, results from greater early-summer growth stimulated by additional moisture from melting snow.

Shelter to livestock in summer and winter is also provided by well-established and vigorous field shelterbelts. Because of these benefits the planting of field shelterbelts in selected locations of government-owned or government-managed community pastures deserves vigorous support.

Field shelterbelts can be arranged to permit convenient cultivation of fields.

All round protection is provided by this arrangement of tree belts.

It is important to leave room for a cultivated margin outside the field shelterbelt.

Plans for Field Shelterbelts

Plans for field shelterbelt planting involve more than the simple operation of planting a few trees. They involve a thorough knowledge of prevailing winter and summer winds, a willingness to modify farm operations to promote and permit the best development of field shelterbelts once they are planted, and an appreciation of the value of field shelterbelts as they improve the appearance of prairie farms, and prairie regions.

Where roadside protection may be an objective a certain amount of hay production and marketing may be involved. In connection with this latter point it is suggested that a co-operative plan as to land use might be worked out between farmers and rural municipalities or provincial Departments of Highways.

For trees to be planted in field shelterbelts soil preparation practices as recommended for farm shelterbelts should be adopted, namely SUMMER-FALLOW for a year (at least). Quick growth of trees is desirable and under field conditions trees are exposed to all environmental elements, harmful and beneficial. Favourable soil conditions at the outset are therefore very advantageous. For a single row field shelterbelt a strip of land about 15 or 20 feet wide should be available. For each additional row to be planted the width of the strip should be increased by four feet or more depending on the distances between rows.

From a practical viewpoint depending on conditions on the individual farm, field shelterbelts need not be closer to one another than 30 or 40 rods. Where a protective belt completely surrounds a farm sufficient space should be left unplanted at the ends of crossbelts to permit easy turning at the ends of them with regular farm implements. Where road protection by field shelterbelts is aimed at, in addition to protection of fields, crops, and animals, the distance from the road boundary to the field shelterbelt should be 100 feet or more. Growth near the ground level is most essential if benefits are to be realized to the fullest. Trees should, therefore, not be pruned.

In planning and planting tree belts around the boundary of a farm a strip sixteen feet wide should be left between the property line and the trees for permanent cultivation. This would apply to sides where no roads exist.

Planters of field shelterbelts must abide by provincial regulations as they relate to tree planting near provincial trunk highways. In Manitoba field shelterbelts established for highway protection are located an average distance of 150 feet from highway boundaries. In Saskatchewan according to a highways regulation no trees may be planted closer than 300 feet to a highway boundary WITHOUT special permission from the Saskatchewan Department of Highways, Regina.

Rural municipalities are also becoming interested in this type of planting.

What to Plant in Field Shelterbelts

As would be expected in so large an area as the Prairie Provinces conditions of soil and climate, as they affect tree growth, vary considerably.

In some localities frost hazards in late spring and early fall are greater than in others. Lighter loam soils usually support better tree growth than clay soils, other things being equal. Height of free water table greatly influences tree growth. Because of greater loss of moisture by evaporation it is more difficult to grow trees in the open plains than in the park belt. In irrigated areas the growing of trees adapted to the area presents no serious problems, except as unfavourable soil conditions (alkali) may exist or build up as a result of irrigation.

Taking all these aforementioned circumstances into account records of individual farm plantings throughout the Prairie Provinces, maintained by the Forest Nursery Station, Indian Head, show that WITHIN areas considered unsuitable for supporting vigorous tree growth there are locations where good shelterbelts exist.

Some reasons why such plantings have been successful are:

(1) The planting site is protected from extreme exposure to sun and hot winds of summer; in other words it slopes away from the south.

(2) Systematic cultivation during the early years of growth and other practices such as fencing to exclude livestock, and the control of insects as recommended by the Forest Nursery Station, have been adopted.

A popular and effective type of field shelterbelt contains only one row. Caragana or maple may be planted alone. Many planters favour a single row containing caragana at one foot apart, and for every sixth, eighth or tenth caragana, a maple or other tree is substituted. The object of this substitution is to eventually secure greater height in the field shelterbelt. In the older field shelterbelts of this type trees substituted for caragana are forging ahead, especially maple and ash.

Some very effective single-row field shelterbelts composed entirely of maple and ash have been established. The maple is popular because of its rapid rate of growth and its capacity to recover from injury caused by insects, winter cold or other factors. Drought resistance and freedom from attack by insects are the valuable characteristics of the ash. For areas inclined to be wet at certain seasons of the year acute willow is strongly recommended. There is every reason to believe that Manchurian elm will be suitable for planting in field shelterbelts. Trees other than caragana are best planted four feet apart in the row.

For planting in slightly alkali spots Russian olive, buffalo berry and Manchurian elm may be tried. Tests are being conducted at the Forest Nursery Station, Indian Head, Saskatchewan, to find the most dependable tree or shrub for planting in areas containing too much alkali for best tree growth.

There is merit also in selecting for planting in selected portions of field shelterbelts near buildings, fruit-bearing or flowering shrubs such as Nanking cherry, choke-cherry, hawthorn, wild plum, villosa lilac. By planting such species the nesting of birds will be encouraged, and the increase of many injurious insects prevented.

It is questionable if a single row of caragana will be of sufficient height to give maximum benefits until it has been planted ten years, but with a single row there is no serious weed menace, if margins are cultivated four or five times during the growing season. Trees should be planted the following year in spaces where they fail to become established.

Acute willow grows strongly in low-lying places.

A well-established field shelterbelt of box elder (maple).

A number of farmers with established field shelterbelts favour those with more than one row of trees. In deciding the number of rows to plant the following points merit consideration. A belt of more than one row is more difficult to cultivate and keep free from weeds. On the other hand, where more than one row of trees is planted, there is greater snow accumulation, better protection, slower melting of snow in spring, economy in land use because of marginal cultivation, and more likelihood of a natural forest floor being built up. Such a field shelterbelt might definitely be considered a farm woodlot, and contain trees recommended for the production of fuel wood and fence posts, as well as a row of caragana to provide soil surface shelter.

The ideal direction in which to plant a field shelterbelt is at right angles to the prevailing winds. In many areas this would be northeast to southwest. This obviously would seldom be practicable. Some planters believe that field shelterbelts planted north and south reduce soil drifting most effectively, while those planted east and west provide the best winter protection and control over snow blowing. North and south plantings are favoured by the majority of planters.

There is also evidence that field shelterbelts planted across the face of sloping land are valuable in bringing about the benefits and influences previously specified. In certain instances planting field shelterbelts on the contour may be very desirable, especially in conjunction with grassing when employed as a means of reducing soil erosion on slopes.

Whichever type of field shelterbelt is planned, prospective planters should remember that specific benefits from them may not be apparent or realized until they have been growing for five or more years. This pre-supposes also that planters are determined to give their field shelterbelts proper care and systematic management by way of marginal cultivation, control of insects and diseases, and prevention of damage and injury by livestock, perennial weeds and fire, so that growth of field shelterbelt trees may be steady, strong and uniform.

Greatest height obtained through substituting ash, elm or other suitable trees for every tenth caragana.

Extent of Planting in Field Shelterbelts

Four Field Shelterbelt Associations were organized by the Dominion Government in 1935 in co-operation with local farmers to investigate the feasibility of planting field shelterbelts on an extended scale, and to determine their value in improving conditions for crop production.

Details as to size, location, and year established of each are as follows

Name	Year estab'd	Location (Southeast Section of area)	Size (sq. mi.)
Lyleton, Man.	1936	12-1-28-W1	42 (7 north) (6 west)
Conquest (1), Sask	1935	11-29-9-W3	63 (9 north) (7 west)
Asteroid, Sask	1936	34-7-10-W3	30 (5 north) (6 west)
Porter Lake, Alta	1936	16-44-2-W4	25 (5 north) (5 west)

(1) Conquest area has been doubled in size as from January 1940.

Tree planting in these field shelterbelt association areas has been progressively undertaken since they were established. Drought and insects were serious problems in the dry 1930's as far as development of field shelterbelts was concerned. To-day, however few large parcels of land in the two larger areas are without some field shelterbelts planted in them.

Statistics as to trees planted in these association areas up to the end of 1945 follow

TREES PLANTED

Name	New Planting	Replacements	Total	Miles of Tree Belts
Lyleton	1,163,616	394,900	1,558,516	255·51
Conquest	2,212,386	1,808,075	4,020,461	389·61
Asteroid	248,425	159,925	408,350	41·46
Porter Lake	147,156	36,750	183,906	26·85
Total	3,771,582	2,399,650	6,171,232	723·23

Besides field shelterbelts planted in the four Field Shelterbelt Association areas, individual farmers throughout the Prairie Provinces have given attention to this phase of farm tree planting in co-operation with the Forest Nursery Stations. For the years specified planters of field shelterbelts and numbers of trees planted are given in the following table

Year	Number of Planters	Trees Planted
1941	95	328,000
1942	78	225,100
1943	71	220,250
1944	69	159,075
1945	60	152,750
1946	85	303,275
Total	443	1,354,550
Annual Average	74	225,758
Average per Planter (Approx.)		3,050 trees

Co-operating also with the Good Roads Department, Province of Manitoba, the Forest Nursery Stations have supplied trees for over 150 miles of field shelterbelts. These have been planted throughout Manitoba for highway beautification and protection.

Seasonal Care of Field Shelterbelts

Spring is when vigorous growth of trees takes place, when loss of water through weed growth should be prevented, and when, by aeration of the soil, the release of plant food from the soil for the use of the trees is vitally important.

By early spring cultivation, annual weeds are readily killed, the production of weed seeds is largely prevented or greatly reduced, and the development of many perennial weeds is weakened and hindered.

It is a short-sighted plan to neglect weeds near trees all summer and at the end of the season be faced with the destruction of seed-laden, tough, mature weed plants. Killing weeds then does little to conserve moisture needed by trees.

Margins of field shelterbelts should not be cropped or allowed to produce weeds.

This well-cared-for belt provides protection for road and field.

Uncontrolled stubble fires will speedily destroy field shelterbelts.

CROPS SHOULD NOT BE SEEDED CLOSE TO A FIELD SHELTERBELT. A margin from five to ten or more feet wide should be kept permanently cultivated along EACH side of a field shelterbelt to provide feeding area for the trees.

Margins of field shelterbelts may very easily be kept free from weeds by the use of a tractor-drawn one-way disk. To keep margins clean throughout the summer the one-way disk should successively be used in opposite directions, so that the soil near the field shelterbelt may be kept as level as possible while weed growth is being destroyed. In most seasons the marginal strips need not be gone over more than three or four times.

The disk causes less root injury and less root disturbance than a cultivator or plough. By the disk also leaf litter which may have accumulated near the field shelterbelt or hedge is readily mixed with the soil.

As margins of field shelterbelts are cultivated branches growing near the ground should not be injured or broken. These branches are important in making a field shelterbelt effective.

For three or four years after they have been planted field shelterbelts should be hoed two or three times during each growing season to prevent weeds developing in the rows using up valuable moisture and plant food, and ripening seeds.

Other conditions being equal plantations under prairie conditions which are cultivated are likely to be superior to plantations where mulching, instead of cultivation, is being practised.

Under certain conditions, however, planters may be justified in mulching field shelterbelts: e.g. in cases where the soil is sandy and subject to blowing or drifting, and where belts are overrun by grass and weeds. In the latter case a *heavy* mulch carefully applied may be the only means of saving the trees.

Besides its effect on growth, a mulch detracts from the appearance of the belt, is untidy, becomes a fire hazard, and provides a shelter for mice which may seriously injure or even kill the trees by eating the bark off near the ground.

Planters are reminded that the advantages of planting field shelterbelts are eliminated if pruning of lower branches is practised. Serious damage may also be done to field shelterbelts by livestock, if allowed to roam at will over and through them.

Farmers contemplating the planting of field shelterbelts should visit one of the Field Shelterbelt Association areas, previously referred to, if there is an opportunity to do so.

Trees are supplied by the Forest Nursery Station, Indian Head, Saskatchewan, to farmers in the Prairie Provinces for field shelterbelt planting under the same conditions as for farm shelterbelt planting. Problems concerning the control of insects which attack shelterbelt trees should be discussed with the nearest Entomological Laboratory, Experimental Farm, Provincial Department of Agriculture, or University, Agricultural Representative, or other government official or Station.

Snow movement is controlled by efficient shelterbelts. Snow drift on west side of a North-South caragana hedge nine feet high. Average depth of snow drift five feet; maximum width of snow drift forty feet.

PUBLICATIONS ABOUT TREES

If interested you may have for the asking a copy of any of the following publications issued by the Dominion Department of Agriculture:

1. Trees for Prairie Farm Planting (FNS Circ. No. 1)
2. Prairie Farms Need Woodlot. (FNS Circ. No. 20)
3. Growing Caragana for Field Shelters and Hedges (Pub. 512)
4. Conditions as to the Preparation of Soil for Tree Planting. (Pub. 514)
5. Special Instructions for Planting Evergreens. (Pub. 515)
6. How to Plant Hardwood Cuttings. (Pub. 516)
7. Instructions for Planting Tree Seedlings, (Pub. 517)
8. How to Make a Sketch of the Proposed Shelterbelt. (Pub. 518)
9. Tree Planting on the Prairies of Manitoba, Saskatchewan and Alberta. (Pub. 623)
10. Tree Planting Near Dams and Dugouts. (Pub. 629)
11. Irrigating a Prairie Farm Garden. (Pub. 657)
12. Vegetables for Prairie Farms. (Pub. 663)
13. The Bluestone Treatment for Poplar Posts.
14. Pruning, Thinning and Utilizing Trees. (Pub. 770).
15. Planning and Planting Field Shelterbelts. (Pub. 785)

Problems and questions about your trees and windbreaks are invited.

Address:

The Forest Nursery Station,
Indian Head, Saskatchewan.

OTTAWA
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